Practical advice for the prevention and treatment of **Diarrhoea**

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Dialogue on Diarrhoea

PRACTICAL ADVICE FOR THE PREVENTION AND TREATMENT OF DIARRHOEA

CMAI AHRTAG UNICEF

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FOREWORD

AHRTAG, UNICEF and CMAI together, are bringing out this edition which presents some of the best of the back issues of **"Dialogue on Diarrhoea"** for people in health work. I want to take the opportunity of thanking the editorial team at AHRTAG for giving CMAI this privilege and UNICEF for making funds available for the same.

This publication will be available to those interested and hopefully will contribute to improved child survival and health care. We would value your comments and feedback on this publication.

Dr. Daleep S. Mukarji
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Dialogue on Diarrhoea is a quarterly international newsletter which focuses on all aspects of the prevention and treatment of diarrhoeal diseases, and has been published in London by the Appropriate Health Resources and Technologies Action Group (AHRTAG) since 1980. The newsletter now has a worldwide readership of over 250,000 and is available in translation in French, Spanish, Portuguese, Arabic and Tamil editions. Future editions are planned in Bengali and Urdu. Readers who would like to know more about Dialogue on Diarrhoea should write to AHRTAG, 1 London Bridge Street. SEI 9SG, U.K.

Practical Advice for the Prevention and Treatment of Diarrhoea is a special compilation based on the best 'Practical Advice' pages from eight years publication of Dialogue on Diarrhoea. These pages cover a wide range of topics, from feeding the anorexic child, making soap and purifying water, to storing oral rehydration salts, developing health education materials and evaluating training. Produced in collaboration with and published by the Christian Medical Association of India and AHRTAG with support from UNICEF.

Contents

How to recognize dehydration

Diarrhoea kills because it causes dehydration. The stools of a healthy child contain relatively little water but a child with diarrhoea passes very watery stools which also contain vital salts (sodium, sodium chloride, potassium and bicarbonate). If the losses are great, both the water and the salts must be replaced or the child will die. To recognize the signs of dehydration it is necessary to ask, look, feel and, if possible, weigh the child.

Important signs and symptoms

● **Stools** Ask about the number and size of the diarrhoea stools. Has there also been vomiting? These answers may also give clues to the severity of dehydration.

● **Thirst** This may be the earliest sign of dehydration. Until a child has lost more than five per cent of his body weight, dehydration causes few signs. When severely dehydrated, a child may not be fully conscious and may be unable to drink.

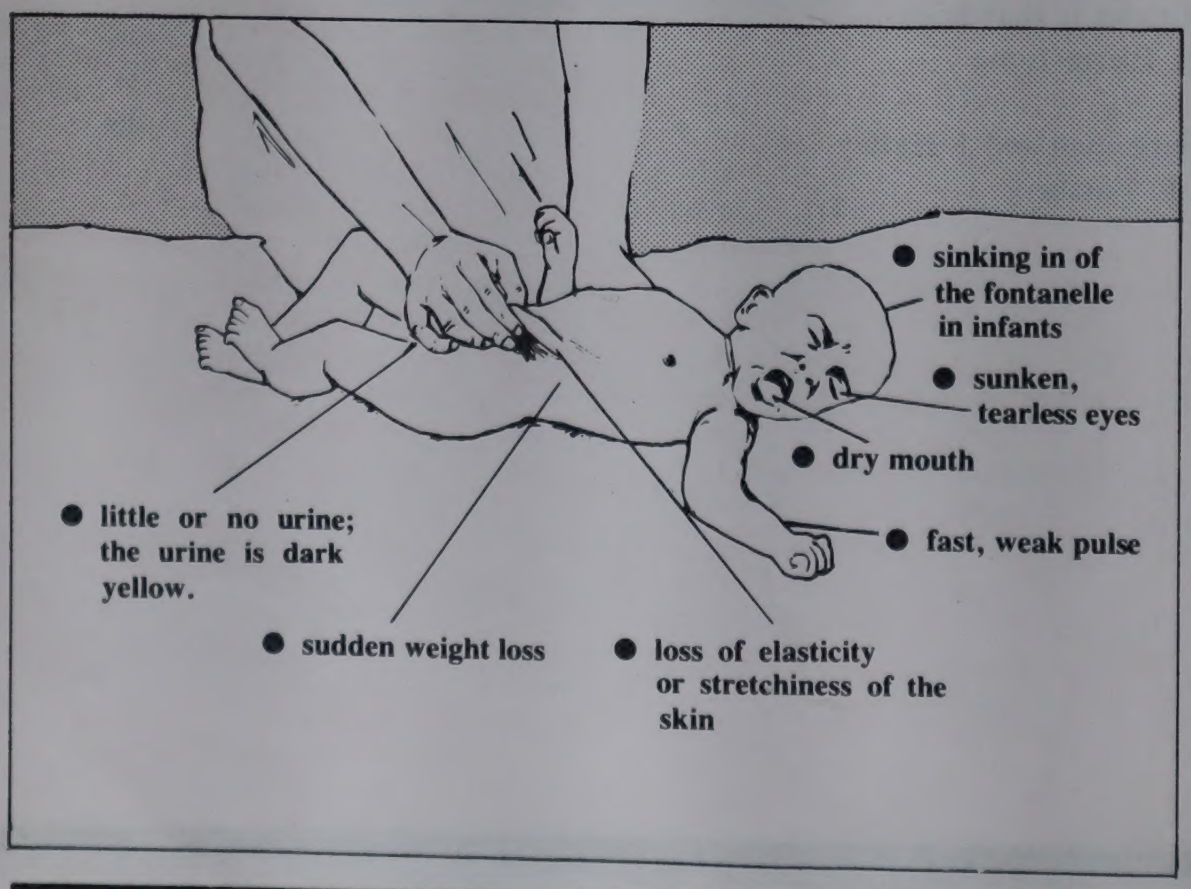
● **Urine** A healthy child usually passes urine about every three hours. The body of a dehydrated child tries to save water and only produces a small amount of dark coloured urine. Mothers usually know how much urine their children have passed, so ask them if there has been less that usual.

● **Condition** If there is no dehydration, a child will appear alert and well. At a later stage, he will be weak, irritable and may look unwell or sleepy. A severely dehydrated child may appear very sleepy or be unconscious. He may also have fits or convulsions.

● **Sunken eyes** A child's eyes lie in soft, wet, fatty tissue. If he becomes dehydrated, this tissue shrinks and becomes drier and his eyes sink back into his skull. His eyes also lose their shining appearance and stay half open when he is asleep.

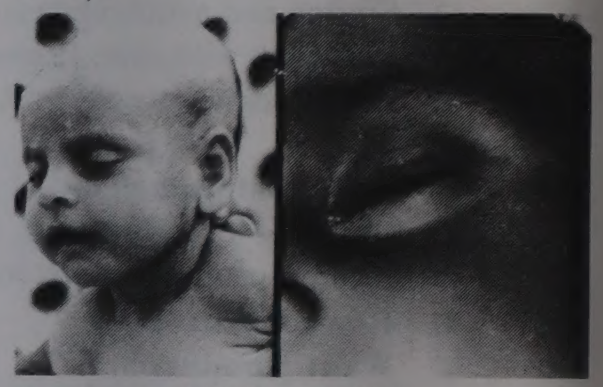
● **Dry mouth** A dehydrated child cannot make enough saliva and so his mouth and tongue become dry. This is an important sign.

● **Breathing** Sometimes, a severely dehydrated child breathes fast and deeply. This kind of breathing occurs when a child has been dehydrated for some days or has been rehydrated with the wrong fluids. Do not mistake this deep, fast breathing for the shallow, rapid breathing of pneumonia.



● **Loss of skin elasticity** The skin of a healthy child is elastic. If you pinch the skin of the abdomen and then let go, the skin quickly flattens again. Dehydration makes a child's skin dry and less elastic so when pinched it sticks up for some seconds before going flat again. If a child is very thin or very fat, loss of skin elasticity is not easy to detect and therefore not a helpful sign in diagnosing dehydration.

● **Pulse** Dehydration makes a child's pulse faster and weaker. When he becomes severely dehydrated, it may not be possible to feel the pulse at the wrist, you may have to feel at the groin or listen to the heart. (With very severe dehydration, the pulse is sometimes slow).



A seriously dehydrated child.
Photograph courtesy of TALC

● **Sunken fontanelle** The fontanelle is the soft place between the bones at the top of a baby's skull. It is large when he is born but closes over by the time he is about 18 months old. When a baby becomes dehydrated, his brain and tissues in the skull lose water and shrink. The fontanelle sinks down between the bones of the skull.

● **Loss of weight** This may occur quickly during a few hours or over several days. A severely dehydrated child may have lost a tenth or more of his normal body weight. If he weighed ten kilograms before the onset of diarrhoea, he may have lost at least a kilo of water and may now weigh only nine kilograms. Loss of weight due to malnutrition occurs more slowly over several weeks or months.

Conclusion

Dehydrated children need urgent rehydration and should be encouraged to drink even if vomiting occurs. Those with severe dehydration and complications such as convulsions should be given oral rehydration fluid and taken to a centre where they can receive special care.

Simple laboratory investigations into diarrhoea

Tony Moody looks at the range of laboratory work that can be carried out at health centre level.

The complete investigation of diarrhoea requires complex and sophisticated laboratory techniques to isolate and characterize the causative agent. This does not exclude the laboratory worker with only simple, basic equipment from being able to provide useful information for the management of diarrhoea.

Essential laboratory equipment consists of:–

- a microscope
- microscope slides and coverslips
- saline solution
- pipettes
- some basic stains and litmus paper

Total cost — less than $500 US dollars.

Macroscopic appearance

Useful information can be gained by careful inspection of the faeces with the naked eye[1]. The history of the patient's diarrhoea should be kept in mind whilst looking at the faeces. The *Clinician's Guide to Aetiology* published in *Diarrhoea Dialogue 7* and the new wall charts now available from the Ross Institute of Tropical Hygiene* may be useful aids in this preliminary screening.

- Profuse watery stools, sometimes flecked with mucus, occur in toxigenic *E. coli* diarrhoea and in cholera (rice water stool).
- Smaller, soft and frequent stools containing blood and mucus occur in amoebic dysentery and in bacillary dysentery due to shigella or campylobacter infections.
- Pale, frothy stools occur in giardiasis, tropical malabsorption and in lactase deficiency in infants.

Acid or alkaline reaction (pH) A simple litmus paper check on the stool pH can be helpful. Acid stools occur in amoebic dysentery and in lactase deficiency. In bacillary dysentery the stool is alkaline.

Microscopic examination

The stool should be as fresh and warm as possible when examined.

Saline preparation Place a drop of saline (0.9% sodium chloride) at room temperature onto a warm slide and, selecting an appropriate section of the faeces, i.e. from an area of bloody mucus or from the liquid part of the sample, use a stick to transfer a *small* amount to the slide. Emulsify this in the saline and place a coverslip over the preparation (discard the stick safely into disinfectant or burn). Examine the sample under the microscope using a 10x eyepiece and, initially, a 10x objective. Close the condenser iris diaphragm sufficiently to give good contrast. Careful searching of the whole coverslip area at this magnification could reveal active larvae of *Strongyloides*, ova of *Schistosoma* or other helminths, or clumps of pus cells and erythrocytes which indicate an inflammatory response to bacteria or amoebae.

Now turn the 40x objective into the viewing position and again search the whole coverslip area.

Dysentery At this level of investigation, the most important distinction that can be made is between amoebic and bacillary dysentery. Both stools may contain pus cells and macrophages and these show up well if a drop of 1% methylene blue stain is run under the coverslip. There may also be erythrocytes (red blood cells) in the stools.

In amoebic dysentery, if the specimen is fresh (still warm), very active trophozoites of *Entamoeba histolytica* (20–40 microns in size, i.e. about twice the size of polymorph leucocytes (pus cells)) ought to be easily observed moving rapidly across the slide, pushing out clear pseudopodia and containing ingested red blood cells. There should be no confusion between amoebae and macrophages which may also contain red blood cells. The amoebae move about and constantly change shape. The macrophages become immobile within a few seconds. In bacillary dysentery, caused by infections such as *Shigella*, *Campylobacter* and possibly invasive *E. coli*, there will be many pus cells, erythrocytes and macrophages, but no active amoebae or cysts. (Occasionally patients may have both amoebic and bacillary dysentery at the same time).

Flagellates Few or no cells in a fatty or unformed sample may indicate the cystic or trophozoite stages of *Giardia lamblia* in the saline preparation. The refractive axostyle and flagellar components of the cysts can be shown more clearly by using an iodine stain (1 in 5 dilution of Lugol's iodine in 10% acetic acid). A thin saline suspension of faeces smeared on a slide, air dried and fixed in methyl alcohol can be stained with a 1 in 20 dilution of Giemsa stain in pH 6.8 buffer for 15 minutes and will demonstrate the morphology of the trophozoites of *Giardia*. Fat is seen as yellow globules or fine needles and can be stained red with 1% alcoholic Sudan 111 stain.

Other flagellates may be present but are not pathogenic.

Vibrio cholerae Dark ground illumination and a hanging drop preparation are needed to identify the darting motility associated with cholera vibrios. A dark field condenser costs about £90 to modify a normal microscope. A temporary version can be contrived using plasticine or putty to use with the 40x objective (see page 61 in volume 1 of Monica Cheesbrough's *Medical Laboratory Manual for Tropical Countries* — reviewed on page seven).

Hanging drop preparation Take a slide and make a ring of about 1cm diameter using vaseline. Place a coverslip flat on a table, add one drop of the liquid stool in the centre and place the vaseline ring on the slide over this drop. Quickly invert the slide and inspect under the 40x objective for the typical darting movement by rod-shaped organisms.

Tony Moody, Senior Chief MLSO, Hospital for Tropical Diseases, St Pancras Way, London NW1, U.K.

[1]*Banu et al 1982 Epidemiologic and clinical features of patients infected with shigella who attended a diarrhoeal diseases hospital in Bangladesh. The Journal of Infectious Diseases, Vol. 146 no 2: 177–183.*

**Inquiries to Dr Isabelle de Zoysa, Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine, Keppel St, London WC1, U.K.*

Control strategies

Although many questions remain about the epidemiology of cholera, there is little doubt about the most effective control measures. Dhiman Barua reviews the key strategies.

Cholera control can best be achieved through a national CDD programme that ensures adequate training, proper treatment, community involvement, uninterrupted supplies of ORS, laboratory and other back-up facilities, regular surveillance, and measures to improve water supply, excreta disposal, personal hygiene and food safety. The important strategies for cholera control are described below:—

1. **Early detection of epidemics** through continuous surveillance.
2. **Active case-finding** with the help of community elders, religious leaders and teachers, and through home visits by local health workers reinforced by mobile teams, if necessary.
3. **Provision of early and proper treatment of cases.** This includes the establishment of temporary treatment centres if the permanent facilities are not within easy reach, so infected people travel as little as possible.
4. **Extremely thorough disinfection** of the clothing, utensils, excreta, vomit, and environs of cholera cases (by boiling, or with disinfectants like lysol, cresol or lime, as appropriate). The dead bodies of cholera victims should be disposed of with the minimum of transportation and rites, which can spread the disease.
5. **Health education**, properly carried out, can achieve a great deal, even in the most desperate situations. All health workers should provide health education while providing services. All appropriate media should be used and special attention given to densely populated areas. Simple explanations of *factors* helping the local spread of disease and the ways in which the population can help interrupt transmission will secure community involvement and minimise panic.

Emphasis on personal hygiene (especially hand-washing with soap and water) and on food and water safety is essential. The necessity for eating only cooked food while still hot and drinking only safe water (boiled, treated, or collected from a safe source and stored properly) should be explained. The need to protect all water sources from contamination must be emphasized; infection is acquired not only by drinking water, but also by bathing or washing articles at contaminated sources. The population should also be informed about the dangers of:

- community feasts and gatherings of any kind, particularly funerals, where safe food and water and proper excreta and waste disposal cannot be assured;
- visiting sick relatives and eating/drinking in the homes of cases;
- contaminated foods e.g. fish and especially shellfish collected from suspect waters, vegetables irrigated or freshened with sewage-contaminated water.

6. **Epidemiological investigations** to determine how transmission is occurring should be undertaken by health workers. In most instances, several factors are involved because of the complex socio-cultural customs of intimate mixing and free exchange of foods/drinks etc, but there are instances when a common source/vehicle (like a well, shellfish, vegetables) has been detected by epidemiological investigations, in which case the outbreak can be quickly controlled by specific interventions.
7. **Provision of safe water** is very important, as the boiling of water is not practical in many situations. Numerous simple and innovative methods are available for the supply and treatment of water. Special attention should be paid to the proper protection, storage and use of water in the home.
8. **Proper disposal of excreta** is vital to protect water sources and the environment. In the absence of any facilities, burial of all excreta, specially those of cholera cases, is essential. Refuse disposal by burning, burial, or other methods should be ensured to prevent fly breeding.
9. **Chemoprophylaxis** i.e. the administration of antimicrobials to healthy persons who are suspected of carrying *V. cholerae* and are likely to become sick or spread the infection is theoretically a sound measure. Yet many countries have experienced that mass chemoprophylaxis does not produce the desired results mainly because the infection spreads faster than the time it takes to reach and treat members of the community. Moreover, by inducing drug resistance, it deprives the actual cases of an effective drug for their treatment.

Therefore, chemoprophylaxis only of *close contacts* in the home of a case was recommended. Recent experience has shown, however, that in many areas the custom of intimate mixing of members of the community and of visiting and sharing foods with extended families makes it difficult to identify close contacts; the recommendation thus becomes unpractical. Chemoprophylaxis may still be effective in situations where everybody in the affected community can be treated *quickly* and *simultaneously* e.g. a refugee camp.

10. **Vaccination** is no longer seen as an effective weapon for cholera control because of its low efficiency in preventing disease and almost total ineffectiveness in preventing the carrier state. Vaccination is still undertaken in some situations, mainly because it is demanded by an uninitiated public. This should be countered by proper health education explaining the limitations of the vaccine and the risks of mass vaccination (e.g. hepatitis).

Dr Dhiman Barua, Programme for the Control of Diarrhoeal Disease (CDD), WHO, Geneva, Switzerland.

For further reading on this subject contact CDD/WHO at the above address.

Successful ORT

Bert Hirschhorn and Ahmed Youssef lists some important points for doctors, nurses and other health practitioners to remember when giving oral rehydration therapy.

- A health worker must *show* the mother how to mix and give the oral rehydration solution. This is equally important in the clinic and at home, to ensure understanding and correct use.
- ORT does not stop diarrhoea; it stops and reverses the dangerous dehydration caused by diarrhoea. In 50 per cent of children under the age of three, treated with ORT, diarrhoea will continue for three to four days or sometimes even longer. This must be explained to mothers. Once children have been properly rehydrated, they should be given about 400-500cc of ORS each day, as well as being fed, to maintain rehydration until the diarrhoea stops.

The child with watery diarrhoea

- A child who has passed just three watery stools will have lost 150-300cc of fluid (water containing essential body salts). This dehydration represents a loss of 1.5 - 3 per cent of body weight in a child weighing 10 kg. Once 2 per cent of weight is lost, the body reacts to conserve water and electrolytes (body salts). The recommended WHO/UNICEF formula for ORS contains 90 mmol/litre of sodium and is the correct treatment for dehydration. If packets of ORS are not available, an equivalent home-made sugar and salt solution should be used. Plain water, or other drinks which contain little salt, are not recommended for dehydrated children, except where salt and sugar are unobtainable. In such extreme circumstances, any drink available should be used to treat a dehydrated child.
- The child will often pass a large watery stool just after ORT has been started. Mothers, and even some health workers, may believe the ORT has increased the diarrhoea. This is not true. What is happening is called the 'gastro-colic' reflex in which anything entering the stomach causes the bowel to expel its contents. ORT does not increase diarrhoea except when too much sugar is used.

The vomiting child

- If a child vomits, stop giving ORS for five to ten minutes. Then give ORS at the rate of one teaspoonful (5cc) a minute. This may seem slow but provides 300 cc per hour and will nearly always prevent further vomiting.
- The amount vomited is usually smaller than the quantity of ORS taken. If the child vomits less than four times an hour, enough ORS is probably being retained. If vomiting persists (more than four times per hour), use a nasogastric tube to give the ORS.

The thirsty child

- A thirsty child is a dehydrated child. Once rehydration is complete, children usually refuse more ORS, unless hungry and not being offered food.
- A child with hypernatraemia (high blood serum sodium content) may drink a large amount very quickly but seldom vomits in spite of this rapid intake. The child's thirst is a good guide to successful ORT.

The child who refuses ORS

This may be because:

- the child is no longer dehydrated and wants food or sleep.
- the child is still dehydrated but tired and needs to be patiently persuaded to drink (see below).
- the child is irritable because of some other cause such as another infection. A nasogastric tube may be the answer but first try to give ORS with a plastic dropper by slipping this between the child's clenched teeth and cheek. The child will usually swallow as a reflex rather than spit out the ORS.

The weak or drowsy child

- The child who is conscious but too weak to drink may need to be rehydrated by nasogastric tube or by intravenous infusion if in shock. It is worth first trying the plastic dropper technique (or a 5cc plastic syringe without the needle) to squirt the ORS into the child's mouth.

The sleeping child

- Seriously dehydrated children sometimes sleep with their eyes partly open so that only the whites show. Sleep during rehydration means one of two things. Either the child is not recovering quickly enough and is becoming unconscious and needs to be woken up and given more ORS; or rehydration is complete and the child is ready for normal sleep.

Abdominal distension

A distended abdomen in children with diarrhoea is caused by:

- giving salt solution without potassium, either orally or intravenously
- giving anti-motility drugs
- giving cow's milk feeds to a child with lactose intolerance
- surgical problem — this is rare.

Newborns

- Most newborns can take spoon feedings. If not, a plastic dropper or plastic syringe without the needle can be used to give ORS. Newborns are often seen to suck at the tip of the dropper.

The child on a nasogastric tube

Use this:

- at night in hospital when both mother and child need sleep.
- in persistent vomiting when the child is not in shock.
- in emergency — for example while setting up an IV in a shocked child or transporting the child to hospital.

When using a nasogastric drip, mark the starting level of the fluid with a piece of adhesive tape. Write the time on this and mark in the same way the correct level for each following hour. This is to check the drip is working at the correct rate.

The child in shock

See above — the weak or drowsy child.

- Give ORS in addition to the IV if the child is conscious, and stop the IV as soon as the child is drinking well.

Feeding the child with diarrhoea

- Breastfeeding should be continued throughout ORT.
- The child with diarrhoea needs extra feeding as soon as rehydration is complete. If bottle fed, give smaller amounts of the normal feed more frequently. There is no advantage to the old method of 'slow reintroduction' of milk and the mother may dilute the feeds for far too long a time. Older children should be given their normal foods but fed more frequently for a few weeks. Yoghurt, orange juice, bananas and coconut water are recommended to bring up the potassium level. (Do not give coconut water *during* rehydration as its potassium content is too high).

Dr N. Hirschhorn, JSI, 210 Lincoln Street, Boston, Ms. 02111, USA.

Storing and maintaining supplies of oral rehydration salts (ORS)

Whether a country is producing ORS locally or using UNICEF sachets, the product must be properly stored so that it remains effective from the time it is delivered to the central store to the moment it is used. Sodium bicarbonate causes decomposition of glucose in oral rehydration salt mixtures. High temperatures and humidity may accelerate this process and manufacturers must consider these factors when preparing and packing ORS.

Storage

● Temperatures in buildings where ORS is stored should not exceed 30°C. Above this temperature the ORS may melt or turn brown. If this happens, it may be very difficult to dissolve and should not be used. If, however, it has only turned yellow, as long as it can be properly dissolved, it is still safe to use and effective.

● Supplies of ORS should not be stored in buildings with galvanized roofs directly exposed to the sun without adequate ventilation. These rooms get very hot.

● Humidity in stores should not exceed 80 per cent. In higher humidity the ORS is likely to cake or turn solid. Increase ventilation and avoid standing water in or near storage rooms.

● As far as possible, storage areas should be cleared of insects and rodents.

● Packets should be packed so they are protected from puncturing by sharp objects.

● UNICEF recommend storing their ORS sachets in stacks of cartons approximately 1 to 1½ metres high.

● A rotating system should be introduced so that the oldest ORS (identified by date and batch number) is used first. When in a hurry, avoid distributing the packets which are at the front or the top unless you are sure they are the oldest in the store.

● Regional storage areas should be located in places that will be convenient for subsequent distribution.

Photograph by Asem Ansari

Preparing sachets of ORS in Bangladesh.

Regular inspection of packets

● Laminated foil ORS packets have an estimated shelf life of at least three years. Note the production date on the label. Packets of ORS must be checked regularly (every three months) to see if the quality is still acceptable. Open at least one packet in each batch to see if the ORS is usable. Locally produced packets of ORS are often packaged in plastic and will probably have a shorter shelf life. It is especially important to check them regularly.

● Check ORS packets in any boxes that appear to be damaged. Open at least one packet from the top, middle and bottom of the box to see if the ORS is still usable.

Keeping records at each point where ORS is received and delivered.

● Records should show:
– the quantity, batch number or letter, and date received.
– the quantity and date issued (i.e. sent from one point in the distribution system to another).
– the amount currently in stock.
– stock level at which a new supply should be requested.

● Records should also indicate any problems (such as spoilage due to a leaking warehouse).

● Supplies should be counted every three months and results compared with quantities shown in the records.

● The evaluation of stock is an important factor in determining future quantities of ORS required.

If you are interested in further information on local production of ORS and quality control, the following publications are available from the Programme Manager, CDD Programme, World Health Organization, 1211 Geneva 27, Switzerland.

● *Guidelines for the production of oral rehydration salts.*

● *Good practices for the manufacture and quality control of drugs.*

Medicines with care

Drugs must be purchased, stored and distributed with professional skill. Patients should use them carefully; this often depends on clear instructions. In this article Professor D'Arcy and Dr Harron outline some practical guidelines.

Purchase

- All medicines must be purchased from reliable and well proven sources; if purchased in bulk by Third World health authorities, then advantage should be taken of the WHO certification scheme, through which the quality of medicines is assured.
- If medicines are purchased by the individual patient, then, where possible, professional advice should be sought, preferably from a pharmacist. It can be dangerous to buy medical supplies from non-official or non-professional sources.

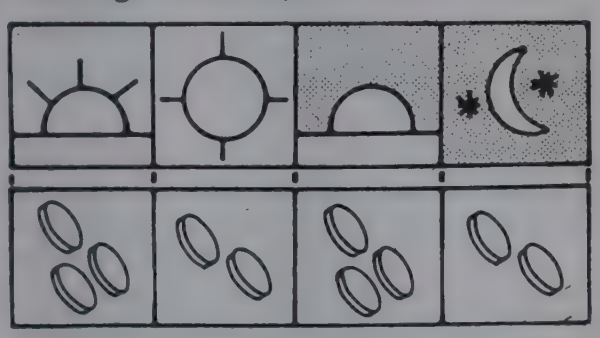
Storage

- Medicines must be stored with care. The basic requirements are the same both for home storage and bulk dispensary storage.
- Medicines:
  – must be kept in a cool and dry place;
  – bulk containers should be stored off the ground so that they cannot be spoiled by rain puddles;
  – should never be allowed to stand in the sun;
  – should be protected in sealed containers, from attack by insects and rats and containers should be properly labelled;
  – must not be used after their expiry date – often this is marked on the label – if not, assume two years from purchase for all solid dosage forms and one year for liquid preparations and creams and ointments. Discard any medicines that show discoloration, fungal growth or any other signs of physical deterioration.
- Some medicines need storage in a refrigerator at a temperature below 5°C; this requirement is usually shown on the container. Do not place any medicines in the freezing compartment of the refrigerator (except for some vaccines which should be stored frozen.)

COSTLY MEDICINES WILL DETERIORATE IF THEY ARE NOT STORED CORRECTLY.

Containers and labelling

- All bulk medicines must be stored in suitable closed containers which are labelled to indicate the nature of the medicine, its source, quantity, dosage and, where applicable, its expiry date.
- Smaller quantities of medicines prepared for individual patient use must be dispensed in a suitable clean and closed container which is labelled with the name of the medicine, the name of the patient, the date of supply, and the instructions for use in a form that can be readily understood by the patient (if necessary pictograms should be used to illustrate the required dosage schedule):



Medicines must not be supplied to patients in a screw of paper or in an open and unwashed container provided by the patient. Every distribution system of medicines should consider the provision of cheap, closable, multipurpose containers as a priority.

Distribution to the patient

- Distribution of medicines should always be in the care of a trained health care worker (preferably supervised by a pharmacist and according to the prescription of a doctor) who dispenses them in a suitable container.
- Labelling of medicines should be reinforced by verbal instructions to the patient or relative. Check to make sure that the instructions have been understood before the medicine is handed over.

COSTLY MEDICINES WILL BE WASTED IF THEY ARE NOT USED CORRECTLY.

Special precautions with medicines for diarrhoea

Oral rehydration salts (ORS) are available through the United Nations Children's Fund (UNICEF) in water-proof foil packets. Both WHO and UNICEF are assisting countries to produce WHO-recommended formulations of ORS; for local production WHO recommends packaging of ORS in polythene where possible. The ORS formulation containing trisodium citrate dihydrate (ORS-citrate) is more stable than the sodium bicarbonate formulation (ORS-bicarbonate) especially in tropical countries where it has to be stored in conditions of high humidity and temperature. Avoid the use of non-WHO recommended formulations of ORS which may be less effective, less stable and more expensive.

Although the use of germ-free water is preferable for mixing the rehydration solution, ORS solution for oral rehydration can be prepared even when pure water is not available. The cleanest safest local water should be used. However, where possible, boil and cool the water before use. To minimise contamination, ORS solution should be made fresh every day, covered and stored in a cool place. Ensure that the volume of water in which the ORS is dissolved is correct. This is vital both in the pharmacy and the home. Check that the patient's relatives understand about the correct volume, and possess a suitable container.

Solutions for intravenous infusion have a role in the treatment of severe dehydration in diarrhoeal diseases. Care is needed as some solutions do not contain appropriate or adequate amounts of electrolytes required to correct the losses from dehydration associated with acute diarrhoea. The needles, tubing, containers (bottles or plastic bags), and fluids used for intravenous therapy must be sterile. Correct storage of these components is therefore crucial and storage conditions must maintain sterility. It is not necessary to store infusion fluids in a refrigerator. The containers should be inspected at regular intervals for damage caused during transport or storage (e.g. leaks, cracks, or splits in containers); all damaged containers should be discarded.

When in use, it is helpful to mark intravenous fluid bottles at various levels with the times at which the fluid should have fallen to those levels. This allows easy and rapid monitoring of the rate of administration of the fluid.

Professor P F D'Arcy, Department of Pharmacy, and Dr D W G Harron, Department of Therapeutics and Pharmacology, The Queen's University of Belfast, Lisburn Road, Belfast BT9 7BL, Northern Ireland.

Using a nasogastric tube

Christine Candy describes the practical issues involved.

Where possible, oral rehydration solution and food should be given by mouth. A nasogastric tube is useful when children are unable to drink safely and in sufficient amounts for any of the following reasons: severe dehydration; if IV therapy is unavailable; low birth weight infants; or the child is drowsy or vomiting. Severely malnourished children may be fed initially in this way if they are too weak or anorexic to eat or drink normally. It is therefore important that health workers know how to use nasogastric tubes.

Equipment

The health worker will need the following:

- Nasogastric tube. A 6 french gauge tube with an internal diameter of 1·4mm, or an 8 french gauge tube with an internal diameter of 1·8mm, is usually suitable. Check that fluid will flow easily down the tube, before passing it down. (If proper nasogastric tubes are not available, polythene/nylon tubes of the right size can be used, provided they are clean, rinsed and have no rough edges.)
- Lubricating fluid such as: 'KY Jelly' or vaseline if available; water; or mothers' saliva, if working in field conditions.
- Syringe (20 ml or 50 ml). This can be used afterwards as a funnel for giving feeds.
- Blue litmus paper, if available.
- Adhesive tape.
- Stethoscope if available.
- Fluid to be given.

Method

- Explain to the child's parents and the child, if old enough to understand, what you are going to do.
- Lie infants flat. Lie unconscious patients on their sides to avoid aspiration (the regurgitation and inhalation of fluid into the lungs). Older children may prefer to sit up.
- Measure the approximate length from the child's nostril to the ear lobe and then to the top of the abdomen (just below the ribs) with the tube, and mark the position. This will be a guide to how far to insert the tube.
- Clean the nostrils to remove mucus. Lubricate the tip of the tube and gently insert into the nostril. Pass the tube down through the nose slowly and smoothly. Stop if the child gags (retches or chokes) and see if the tube is coiled in the mouth. If it is, gently pull out the tube and try again.
- If the child is conscious, give a drink of water. This helps to pass the tube down towards the stomach and reduces discomfort.
- If the child coughs, the tube may be going into the trachea (windpipe) — pull it out gently and try again. NB. A child who is partly or completely unconscious, may not have a cough reflex and the tube could go down the trachea without causing coughing. Always watch for cyanosis (blue lips and tongue) and distressed breathing. These may be the only signs in an unconscious patient that the tube is entering the lungs.
- Continue to pass the tube down until the position marked reaches the nostril. The end of the tube should then be in the stomach. Check once again for choking, restlessness or cyanosis. Fix the rest of the tube with adhesive tape below the nose and to the cheek or side of the forehead.
- To check that the tube is in the stomach, use the syringe to suck up some fluid and test with blue litmus paper. If the colour changes from blue to red the tube is in the stomach. If blue litmus paper is not available, but the fluid sucked up is clear, containing mucus or partially digested food, this also shows that the tube is in the stomach.
- Another test is to inject 20 to 50 ml of air down the tube while listening to the upper abdomen, either with a stethoscope or directly with the ear. A distinct gurgle will be heard as air enters the stomach. (This will not be heard if the tube is in the lung).
- If satisfied the tube is in the correct position, inject 5 to 10 ml of fluid (saline or OR solution, not milk formula) by syringe, and again look for choking or cyanosis.

Rehydration and feeding

Where possible, give a continuous drip of fluid. If this is not possible, give frequent small amounts using the syringe as a funnel. Hold the syringe upright, about 30 cms above the child's head, for a slow and gentle flow. After each feed, close the tube with a stopper or clamp and note amount given. Before each feed (or every four hours in continuous feeding), look into the mouth to make sure the tube has not come out of the stomach into the throat. Suck up a little fluid and check as before.

Children who are able to drink will normally refuse ORS once rehydration is complete and they are no longer thirsty. However, in nasogastric feeding, the normal thirst mechanism is bypassed and it is possible to give too much fluid. It is therefore important to stop giving ORS by nasogastric tube as soon as the child is able to drink normally or is fully rehydrated. Overhydration can be dangerous.

Prolonged nasogastric feeding

If feeding continues for more than 24 hours, do the following:

- Clean the nostrils with warm water every day, especially around the tube. Change the tube to the other nostril every few days. Keep the mouth very clean with a dilute solution of 8 per cent sodium bicarbonate, if available, or citrus fruit juice. This helps to keep the saliva flowing and prevents infections.
- Wet adhesive tape quickly makes skin sore. Take off damp tape with plaster remover or ether. Clean skin with water and dry thoroughly. Change the position of the tape from time to time.

Stopping nasogastric feeding

If feeding has been continuous, start by changing to hourly then two hourly feeds. Then give every other feed by mouth during the day, continuing tube feeds at night. Tube feeds can then be gradually stopped as the amount taken by mouth increases. To remove the tube:

- Remove the adhesive tape.
- Take the tube out gently and smoothly. (Older children may prefer to remove it themselves).
- Offer the child a drink and gently cleanse the nostrils.

After prolonged nasogastric feeding a child may have feeding problems or loss of appetite. Patience and encouragement are needed to establish feeding by mouth again.

Christine Candy, Paediatric Nurse Tutor, Queen Elizabeth School of Nursing, Edgbaston, Birmingham, U.K.

Choosing a hand pump

John Cuthbert reports on recent testing of hand pumps

The choice of pump must take into account the depth of the well and local conditions, particularly with regard to maintenance. Many pumps are installed in areas where they cannot receive the necessary maintenance and therefore stop working after a short time. A suitable pump should be:

- simple to maintain locally
- easy to repair without using expensive, imported spare parts
- constructed so that it is difficult to steal parts of the machinery.

Other important points:

- there should be as few external fittings as possible, as these can easily be knocked out of place
- if the water is corrosive, the materials from which the pump is made should be chosen to minimise the effects
- if the well dries out from time to time, a conventional pump cylinder with leather cups should be avoided
- otherwise conventional brass cylinders with leather piston cups are quite satisfactory
- the pump must be simple to work. A long handle with a relatively small arc of movement and a counter-balance weight is easiest to use.

Best buys

The India Mk. II

In tests of 12 pumps carried out in the United Kingdom, the *India Mk. II* pump was found to be reliable, required little maintenance, was very easy to use and cheap (£65)*. Its disadvantages are that careful positioning is required in installation and that it can only be used in wells of 20 metres or more since it relies on the weight of the water column to carry the piston downwards.

The Constallen

The *Constallan* pump from England is also good value at £170* and uses stainless steel and plastics in its cylinder for corrosion resistance. It was found to be reliable, although some wear results from pumping waters containing sand. It is not as easy to use as the *India Mk. II*, having a much shorter handle. Installation of the thin and easily damaged cylinder requires care, and maintenance or repairs to the cylinder could be difficult in the field.

The Constallen.

Alternatives

Verguot Hydropumpe 4C2

Other pumps worth considering include the *Verguot Hydropumpe 4C2* from France at about £350–£400*. This is a foot operated pump which was relatively easy to use, although women wearing saris or long dresses might have some problems. It seems to be reasonably reliable and corrosion resistant. However, it is a complex, novel design. Availability of spares could be a problem and repairs in the field may be difficult. A well organized system would be necessary for maintenance although this should rarely be needed.

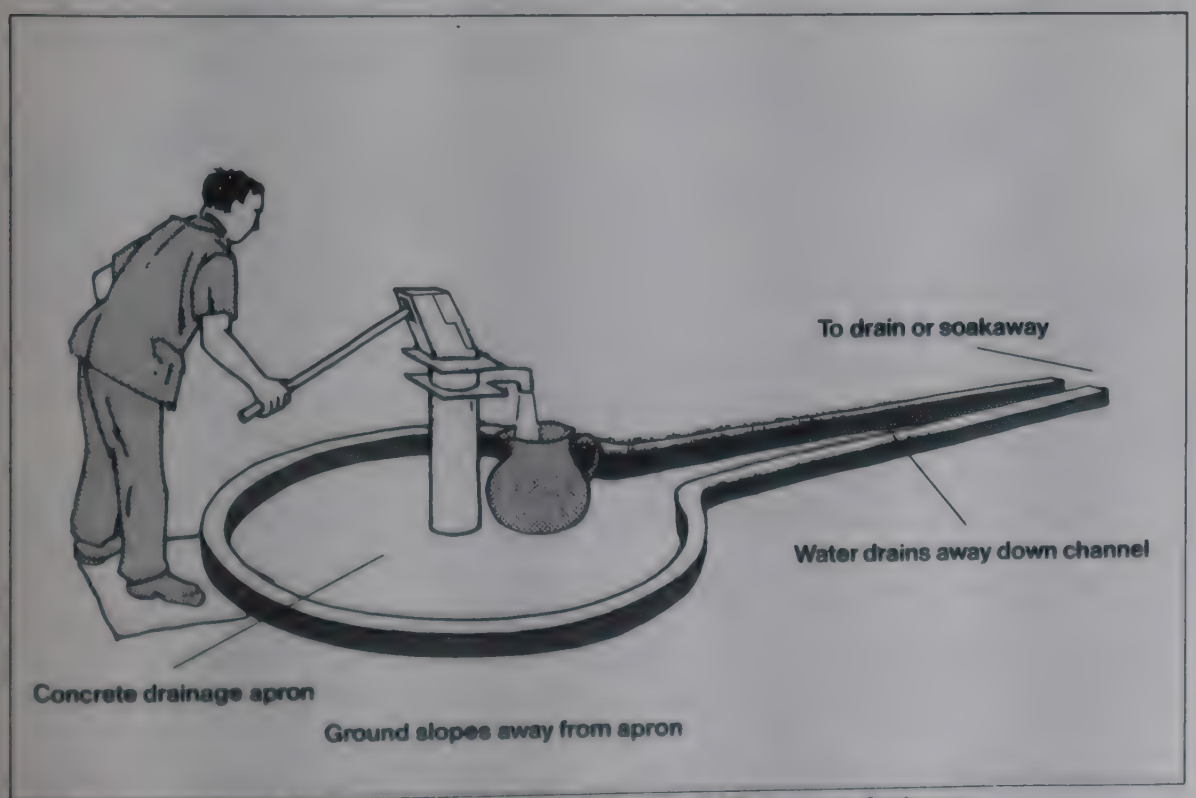
The Mono ES 30

The *Mono ES 30*, an English rotary pump at £370*, is very strong and reliable and requires hardly any maintenance. There could be problems in sealing it against contamination of the well, unless a robust well head is available. It is also easy to push rubbish into the spout and down the pump. The samples tested gave a poor performance but the manufacturer claims that the design has now been considerably improved.

It is clear that no one pump is suitable for all countries and all situations. Further evaluation is needed and the World Bank, with United Nations Development Programme (UNDP) funds, is now implementing further extensive tests of such pumps around the world.

* All prices and information correct at time of going to press in 1981.

John Cuthbert is Director of the Water Research Centre, Stevenage, Herts.



A well constructed platform around a hand pump, with proper drainage.

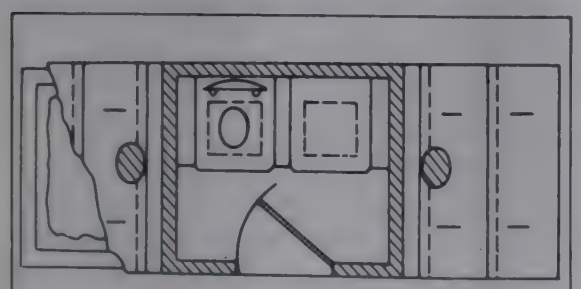
Appropriate latrines

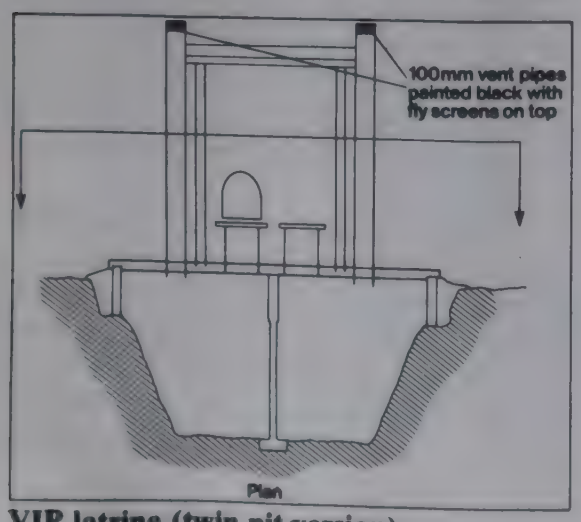
Geoffrey Read describes two types of excreta disposal systems which are both affordable and appropriate for most developing countries.

There are some 2,000 million people in the world today who have no excreta disposal facilities. These will all have low incomes and are unable to afford piped sewerage. *It may also be technically inappropriate for them.* Alternative, well-proven technologies can be used and, if properly designed, they will safely dispose of excreta on site, while being both socially acceptable and affordable to the house-holder. The on-site excreta disposal technologies appropriate for most developing countries are the *Ventilated Improved Pit Latrine (VIP)* and the *Pour Flush Waterseal Latrine (P/F)*.

The Ventilated Improved Pit Latrine (VIP)

This latrine comprises a seat or squatting plate (depending on cultural preference) which forms part of a concrete slab over a large pit. The pit is ventilated by a pipe which is covered at the exit by a non-corrodable insect-proof screen. The pipe removes odours and gases and is effective in controlling insects which breed in the pit. Removable concrete covers enable the pit to be emptied when full (pits fill at the rate of between 40 and 60 litres per person per year).





VIP latrine (twin pit version)

Illustrations by Richard Inglis

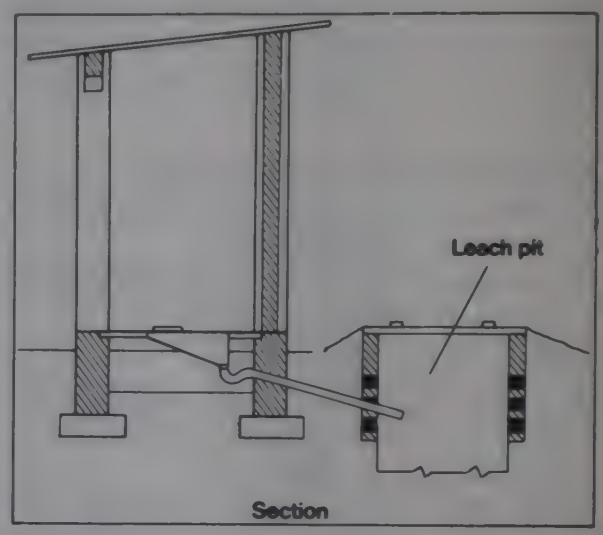
The preferred *VIP* design has twin pits which are used alternately. When one pit is full, it is rested, and the excreted pathogens die away over time leaving a rich humus. During this time, the adjacent second pit is used till full. Two years should be allowed to ensure that the contents of the first pit are pathogen-free. The first pit is then emptied and re-used and the second pit is rested. In this way the latrine remains in one position.

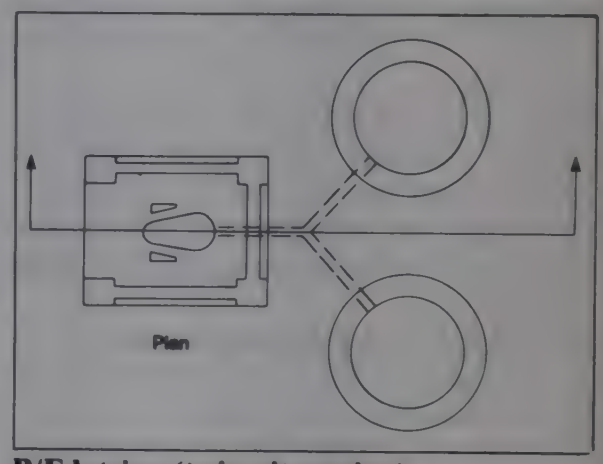
The householder can construct a building over the pit in any available – but preferably permanent – material. The pit cover slabs should not be constructed using wood, bamboo or other materials which will rot. In cases where the water table is high or the ground unstable it will be necessary to line the pit with brickwork or blockwork, ensuring that the lined pit remains porous.

The Pour Flush Waterseal Latrine (P/F)

This model comprises a squatting plate and pan over a water seal, connected by small diameter pipework to an underground leach (filter) pit. The preferred design has twin leach pits, which are used alternately as with the *VIP* latrine. Deposited excreta and urine is flushed away by manually pouring between two and three litres of water into the pan. The waterseal is thereby maintained keeping out odours, gases and insects. The leach pits are generally lined with honeycomb brickwork through which liquids filter away into the ground. The pits fill at about 30 litres per person per year, and are emptied alternately. In heavy clay soil or impermeable rock, the effluent will need to be piped away.

The *P/F* is most appropriate in Hindu and Islamic societies where water is used for anal cleansing. The *VIP* will give excellent service in situations where water is in very short supply. When planning sanitation programmes, existing socio-cultural practices must be carefully considered and the programme tailored accordingly. Provision should also be made for disposing of dirty wash water, either into a separate soakaway or into a piped or covered stormwater drain.





P/F latrine (twin pit version)

Latrines should be located as far away as possible from water supplies; if in doubt get professional advice. Health education, technical support and information programmes are essential components of sanitation development work. In particular, use by all the family must be ensured if the sanitation programme is to be successful.

The provision and effective use of affordable and appropriate excreta disposal systems will bring significant long-term health benefits to the millions of people presently living in unhygienic conditions and continually suffering from gastro-intestinal infections, high infant mortality and low life expectancy.

Geoffrey Read, World Bank/UNDP Technology Advisory Group (TAG).

How to make soap

This article shows how soap can be made cheaply and easily on a small scale, in the home or village, using locally available ingredients.

Soap is a very great help to people in being able to keep themselves and their surroundings clean, and is therefore important in preventing the spread of disease. In some countries soap is unavailable or very expensive. The table below shows the ingredients necessary to make soap.

Basic ingredients

For one bar of soap you will need:

- 230 ml (1 cup) of oil or clean, hard fat.
- 115 ml (½ cup) of water.
- 23.5 gms (5 teaspoons) of caustic soda (sodium hydroxide) crystals or lye.
- Borax and a few drops of perfume are optional.

For 4 kg of soap you will need:

- 3 litres/2.75 kg (13 cups) of oil or clean, hard fat.
- 1.2 litres (5 cups) of water.
- 370 gms of caustic soda (sodium hydroxide) crystals or lye.

- Animal fats such as tallow, mutton fat, lard, chicken fat or vegetable oils such as olive, coconut, palm and palm kernel, cottonseed, castor, maize, soybean, safflowers and groundnut can be used. The best soap is made from a mixture of oil and fat. Even polluted fat can be used as long as it is first melted then strained through a finely woven cloth. Coconut oil makes a softer soap than the other oils (because it is low in stearic acid) and can be greasy. It is however the only soap that will produce a lather in seawater — so in some cases using some coconut oil is good.
- The best water to use for soapmaking is soft water. Rainwater is therefore good. Hard water contains mineral salts which hinder the cleansing action and lathering of the soap. To soften water, add 15 ml or 1 tablespoon of lye to 3.8 litres/1 gallon of hard water and leave to stand for several days after stirring. The water poured off from the top, leaving a sediment behind, is soft water.
- Only caustic soda can make hard soap. The alternative, if caustic soda is not available, is potash or lye, leached from ashes. Caustic soda should be stored in sealed containers to prevent absorption of moisture from the atmosphere.
- Borax, although not necessary, can be used to improve the appearance of the soap and increase the amount of suds produced.
- Perfumes can act as a preservative, but, if used should be resistant to alkali. For 4 kg of soap one of the following should be used: 4 teaspoons of oil of sassafras; 2 teaspoons of oil of wintergreen, citronella or lavender; or 1 teaspoon of oil of cloves or lemon.
- Different proportions of ingredients produce different types of soap: for hard scrubbing soap use tallow for the fat quota; for laundry soap use ½ lard/cooking fat with ½ tallow; for toilet soap use ½ tallow with ½ vegetable oil.

Equipment

To make soap you will need:

- Two large bowls or buckets made from iron, clay, enamel or plastic. Never use aluminium — it is destroyed by lye/caustic soda.
- Measuring cups made from any of the same materials as above, again except for aluminium.
- Wooden or enamel spoons, or smooth sticks for stirring.
- Watertight wooden, plastic, cardboard or waxed containers for a mould; gourds, coconut shells or split bamboo halves can also be used.
- Cloth or waxed paper can be used to line the moulds so that the soap can be easily removed.

Method

- Dissolve caustic soda in water to produce lye water.
- Pour oil into separate container (add borax at this point if desired).
- Pour the lye water slowly onto the oil, stirring continuously in one direction. If an oil-fat combination is being used add the melted and cooled fat to the oil/lye solution.
- Add perfume/colouring now if desired/available.
- When the mixture has a thick consistency, put into lined moulds/ cooling frames and leave to set for two days.
- If fat only is being used, it should first be clarified by boiling it up with water and allowing the mixture to cool down and set. The clean fat can then be easily separated and melted again for soapmaking. Always allow the fat to cool down before adding to the lye water, slowly stirring in one direction.

Once the soap is made

- Do not move the moulds.
- When ready, cut the bars into slabs/ smaller bars.
- Stack on trays and leave to dry thoroughly for 4-6 weeks.
- When dry, cover to prevent further loss of moisture.
- If the soap is not set after two days, or there is grease visible on top of the soap, leave it to set a little longer.

How to recognise good soap

Good soap should be hard, white, clean-smelling, tasteless and should shave from the bar in a curl. It should not be greasy or taste unpleasant. The main point to remember is that the soap you make does not have to be perfect. As long as it is usable it is better than no soap.

If, however, problems occur, there may be several reasons. Spoiled soap only happens when:

- the wrong materials are used.
- the oil or fat is too rancid or salty.
- the lye water used is too hot or cold
- the mixture is stirred either too fast or not long enough.

To reclaim soap:

- cut into small pieces and add to five pints of water.
- melt over a low heat.
- boil the mixture until it becomes syrupy.
- pour into a mould and leave for two days before cutting up as before.

WARNING — caustic soda is very dangerous and can burn skin and eyes. Protective gloves should be worn if possible when making soap. If burns occur they should be washed immediately with cold water and then treated with vinegar or citrus juice. Never add water to caustic soda — always add the soda to the water.

For further reading, please write to AHRTAG, 1 London Bridge Street London SE 19SG

Water purification

Most surface water — from rivers, streams and ponds — needs to be purified before it is fit to drink, as it may be contaminated with soil, decayed vegetable matter, and human or animal faeces. Drinking contaminated water is a major cause of diarrhoea. This article briefly describes various ways in which water can be purified. The four most common methods of water purification are:

- storage;
- filtration;
- chemical disinfection;
- boiling.

Storage

Contaminated water can be made safer to drink if it is stored for at least two days. Within that time many harmful organisms will die, and most of the dirt will sink to the bottom of the pot. But this will not kill **all** pathogens and is not effective for very dirty water.

Storage containers can be made of metal, glass, plastic, or glazed ceramic materials. The use of earthenware pots should be avoided if possible, because of the risk of bacterial growth in the porous clay walls. Water can be purified by storage in the home using three pots. Two big pots are used for fetching water on alternate days. The first pot is allowed to stand for two days. Then the clear top water is carefully poured into another (smaller) pot for drinking. The remaining water can be used for washing. When the first pot is empty it is cleaned and refilled, then it is allowed to stand for two days again. Meanwhile the second big pot is used in the same way as the first. In this way each day's drinking water has been standing for at least two days before it is used. Storage containers must be covered to prevent the water from becoming contaminated, to stop algae from growing and to prevent evaporation.

Filtration

A sand filter will remove most of the suspended organic material in water, but it will always let viruses and some bacteria pass through. For this reason, it is best, if possible, to boil or chlorinate water after it has been filtered.

Household sand filter — Using wide, earthenware pots, about 750mm high, 1 litre of water can be filtered every minute. Inside the pot put a thin layer of small stones. Cover this layer with a layer of charcoal, over which put a thick layer of sand. Another layer of gravel can be put on top to stop the sand from being disturbed when water is poured in. The filtered water passes through a tube from the bottom of the filter pot into a collecting vessel. A similar version can be made from three or four clay pots standing on top of each other. The pots, in turn from the top, contain gravel, and charcoal. In the four-pot version the lowest pot is used for storage of the treated water. The filter is simple to make using local materials, and can be kept working well by occasionally removing the top layers and replacing them with fresh gravel and charcoal.

Chemical disinfection

Iodine — Iodine can be used for disinfecting water and is excellent provided the water is not too dirty. WHO recommend two drops of 2 per cent tincture of iodine per litre of water. If the water is thought to be highly polluted then the amount should be doubled — such amounts are not harmful but will give the water a slightly medicinal taste. Iodine compounds, such as tetraglycine potassium tri-iodide are supplied as tablets which are claimed to be effective against amoebic cysts, and some viruses and bacteria.

Chlorine — Chlorine is a good disinfectant for drinking water as it is effective against bacteria associated with waterborne diseases. Bleaching powder contains about 25-30 per cent chlorine. **(WARNING: Keep all kinds of bleach away from children and out of eyes. Do not swallow.)** About 37cc (2½ tablespoons) of bleaching powder dissolved in 0·95 litre (1 quart) of water will give a one per cent chlorine solution. To chlorinate the water, add three drops of one per cent solution to each 0·95 litre (1 quart) of water to be treated (2 tablespoons to 32 imperial gallons), mix thoroughly and allow it to stand for 20 minutes or longer before using the water.

Alternatively, simple chlorinators, which dispense chlorine at a constant rate into a water supply, can be bought or made with local materials. An example is a diffuser chlorinator which is used in non-flowing water supplies like wells, cisterns and tanks. It consists of a pot filled with coarse sand and chlorine powder, submerged in a water supply. The chlorine seeps into the water supply through holes in the container. Diffuser chlorinators have slow rates of disinfection and are most effective in wells or tanks not producing or holding more than 100 litres/day.

Boiling

Boiling is the best way of destroying germs in water. The water must be brought to a good 'rolling' boil (not just simmering) and if possible kept boiling for ten minutes (this may need to be longer at high altitudes). Store the water in the container in which it has been boiled, or, if pouring the water into another container make sure that it is clean. There are certain issues to consider when boiling water to purify it:

- Pathogen survival — some pathogens (E coli and faecal coliforms) and cysts such as giardia lamblia may be killed at lower temperatures than boiling point (about 50 - 64°C rather than 100°C).
- Cost — boiling water for ten minutes or more may be impractical where fuel is expensive or difficult to obtain. Boiling and cooling water also takes time.
- Recontamination — unless boiled water is carefully stored and used, it may be recontaminated by dirty containers, insects, dirty hands etc.

Other methods

Other methods have been used to purify water with differing levels of success. These include using sunlight, alum, ash, clay and traditional materials such as seeds and plants. Some studies have shown that exposing water to sunlight for several hours in a transparent container can reduce the number of enteric pathogens. A recent study in Bangladesh showed that potash alum prevented bacterial growth in ORS solution when used in a concentration of 0·05-0·1 per cent. More research is needed to study traditional and alternative methods of purifying water. The Editors would welcome letters from readers about their own experiences of treating water using traditional methods.

For more detailed information about the methods of water purification described above, please write to Dialogue on Diarrhoea at AHRTAG.

Breast to family diet

Weanlings are particularly vulnerable to infection. Michael Gurney considers how this important time can be made safer and more beneficial for the baby.

WHO photo

Small, frequent meals.

Weaning does not refer only to the stopping of breastfeeding. It is the gradual process by which a baby becomes accustomed to semi-liquid and solid foods which increasingly complement breastfeeding. It is complete when the child is eating the regular family diet and breastfeeding has completely or nearly stopped. Phrases such as *"the baby should be weaned at six months"* can be very misleading.

Weaning is one of many changes that all take place together. The weanling child is becoming accustomed not only to new foods but to a new environment and to new physical and mental skills. He is very vulnerable to illness at this time.

When should weaning start?

The best way to wean varies according to the circumstances of each family. If a mother has to go out to work she may have to start giving extra foods earlier than is best for the baby, while continuing to breastfeed whenever she is at home. Where sanitation and cooking facilities are poor, she may be wise to start weaning foods later than is ideal.

In general, breastmilk is perfectly adequate until the baby is at least four to six months old, or weighs about seven kilograms. Other foods need to be introduced about this time to complement breast milk. They are unnecessary, and can be dangerous, if given earlier.

What makes a good weaning diet?

Texture: At first, the baby needs liquid foods. These become thicker until, by his first birthday, he is able to chew pieces of food. A good practice is to start with a porridge or pap containing the food ingredients mixed together into a creamy consistency.

Quantity: Babies have very small stomachs and are growing very fast. They need small amounts of foods which are rich in dietary energy. *Little and often* is the rule. At first weaning food is extra to breastfeeding; as time goes on it becomes the main food, and breastfeeding becomes less important. The frequency of feeding should increase rapidly until the baby is soon taking at least five meals a day plus breastmilk. Feeding should continue at this rate well into the baby's second year. Snacks, such as fruit, between meals are useful — as long as they are always clean.

Quality: Most weaning diets around the world are based on starchy staple foods such as rice, potatoes and cassava. This is fine as long as certain precautions are taken. Such staples are *not* nutritious enough in themselves. A porridge using the staple mixed with something extra is excellent. The best additions are peas and beans mashed with the skins removed; milk; meat (finely chopped) or other *animal foods;* plus dark green leafy vegetables or yellow-orange fruits such as papaya and mango. Suitable recipes and methods of preparing weaning mixes can be found and developed in most cultures.

Energy supplement: Many weaning porridges do not contain enough energy for the baby's needs. During cooking, the starch used in the porridge takes up water and becomes very bulky. Extra oil added to the porridge has two benefits: it adds energy (oil is very rich in calories); and the oil changes the consistency of the porridge, making it easier for the smallest babies to swallow. Oil should be incorporated in all weaning foods except where obesity is a problem.

Two other ways of reducing the bulkiness of weaning foods and making them better and easier for the infant are fermenting or roasting the staple grains. This is done in some parts of the world and can be of great benefit.

Economy: If people spend extra money to buy special weaning foods they are likely to give too little in order to make it last. Weaning foods made at home can be just as good as those bought from shops. In fact, some products sold for babies are very poor in nutritional quality. It is usually best to rely on foods available from the *family pot.*

Hygiene: Contaminated food is one of the most critical problems during the weaning period. In poor, unsanitary environments it is very difficult to avoid diarrhoea in young children. Breastfeeding provides a major protection against diarrhoea. Good hygiene is essential in preparing weaning foods and keeping them until the next feed. But it is difficult to feed a baby five or more uncontaminated meals a day, when the mother can only afford to light the kitchen fire once. Local technologies need to be used to resolve the problem.

Utensils: Bottles and rubber teats are difficult to keep clean. Moreover, in order for a weaning porridge to pass through the teat it has to be very dilute, therefore the baby risks not getting enough food. *It is best to keep suckling from the breast,* not the bottle. When food is mashed for a baby, avoid using sieves which are difficult to clean. A cup and spoon are suitable for giving weaning foods; this allows the mother to change the food from liquid to semi-solid as the baby grows.

Breastfeeding: Breast milk is very nutritious and protects against infections. It also provides the close, loving contact that encourages secure development. As far as possible, breastfeeding should continue throughout the difficult process of weaning.

Dr Michael Gurney, Nutrition Unit, WHO, CH-1211 Geneva 27, Switzerland.

Feeding the anorexic child

Children with diarrhoea may not want to eat, yet feeding at this time is particularly important. Shanti Ghosh suggests ways to overcome this problem.

A child with diarrhoea may lose his appetite (become anorexic) and, as a result, be difficult to feed. Anorexia can reduce the amount of food consumed by up to 40 per cent. In many cultures, deliberate withholding of food during diarrhoea is very common and further reduces intake. In addition, medical advice often supports withholding of food both during and after diarrhoea, in the belief that food is not absorbed and that the bowel needs to be rested. This leads to rapid worsening of the nutritional status of a child who may already be malnourished.

Breastfeeding

Fortunately, even an anorexic child will usually breastfeed happily. This is because, as well as nourishment, breastfeeding gives comfort and a feeling of closeness to the mother which is particularly important when a child is unwell. Studies have shown that the amount of breastmilk a child takes does not decrease dramatically when a child becomes ill with diarrhoea. Therefore it is important to continue breastfeeding, even after the age of six months when diarrhoea is more common. (After six months breastmilk alone is not enough for the total nutritional needs of the child and additional semi-solid foods should be given.) As far as possible, this additional food should continue to be given to the child with diarrhoea, even though the appetite may be reduced. It has now been shown that the ability of the intestine to absorb nourishment is not greatly diminished in diarrhoea.

Photo by K Indirabai (DD photographic competition)

Breastfeeding gives comfort as well as nourishment to the sick child.

Even the most dedicated mother may find it difficult to feed an anorexic child; she will have to use all her powers of persuasion and ingenuity to make the child eat. Often the child will turn its head away when food is offered, and may not want to eat the usual family food. The anorexic child may find chewing difficult as not enough saliva is produced, so rolls the food around in its mouth and either keeps it there or spits it out. Small quantities of 'soft' foods, which do not need chewing, and which can easily be swallowed, should be offered frequently. There are suitable foods in every culture. For example, porridge, gruel, boiled rice, a mixture of rice and lentils, yoghurt, mashed banana, boiled potatoes or carrots. Fish and eggs can be given where culturally acceptable and available. A mother needs plenty of patience not to get cross with her child, especially if she is tired and busy.

Give the child the food it wants

Some children may want to eat savoury foods, and others may prefer something sweet. Mothers should not be too particular about what the sick child eats, as long as it eats something. Many mothers have their own ideas about which foods are easily digestible and which are not. They may insist that a child takes what they consider to be more suitable, while an anorexic child may have its own preferences. The child may not want to eat bland or tasteless food, instead it may prefer familiar foods that have more flavour or are spicy. What is important is that food is eaten, rather than which food.

TALC photo

A mother needs plenty of patience when feeding an anorexic child.

The bulkiness of cereal based foods can be a problem, as a large volume may contain little nourishment. This can be even more of a problem for the anorexic child. The bulk can be reduced by roasting the cereal before cooking, or, better still, by malting, a process involving germination, drying and then roasting again. Adding some oil or butter will increase the energy density.

During the recovery phase of diarrhoea the appetite increases and the mother should take advantage of this to offer more food to the child. Extra food at this stage is important as it helps a child's growth catch up some of the loss which occurs during the illness.

Dr Shanti Ghosh, A1/18 Panchshila Enclave, New Delhi 110017, India.

The feeding and care of infants and young children, 1985. Ghosh S. Voluntary Health Association of India (VHAI), C-14 Community Centre, Safdarjung Development Area, New Delhi 110016, India. Price:14 rupees.

Vitamin A: preventing blinding malnutrition

There is no real scarcity of vitamin A in many African and Asian countries. Problems arise when fruit and vegetables containing vitamin A cannot be conserved, or when it is not culturally acceptable for or is difficult to get children to eat vegetables.

In many areas where xerophthalmia is prevalent there is an abundance of fruits and vegetables that provide a natural source of vitamin A. These are, however, often not eaten, especially by children, the main group who suffer from blinding malnutrition. Many nutrition education programmes are now focusing specifically on children. School children are an ideal target for learning the importance of fruits and vegetables to family health. There are many ways of preparing green vegetables to make them more acceptable to children — for example, chopped and mixed with lentils and other pulses, minced meat, stews and soups. If children still refuse to eat greens, and the family cannot afford the animal foods containing vitamin A (see table), carrots and coloured fruits are also useful sources. It is important to note that vitamin A cannot be satisfactorily absorbed by the body unless there is sufficient oil or fat in the diet.

Common sources of vitamin A

Ready-made sources	Carotene sources*
Meat	Green and yellow vegetables (especially dark green leaves)
Liver	
Fish	Red palm oil
Milk and dairy produce	Yellow marrow, pumpkin and squash
Eggs	Carrot, mango and papaya

*The body makes vitamin A from carotene in the diet.

Vegetables for sale in an Asian Market.

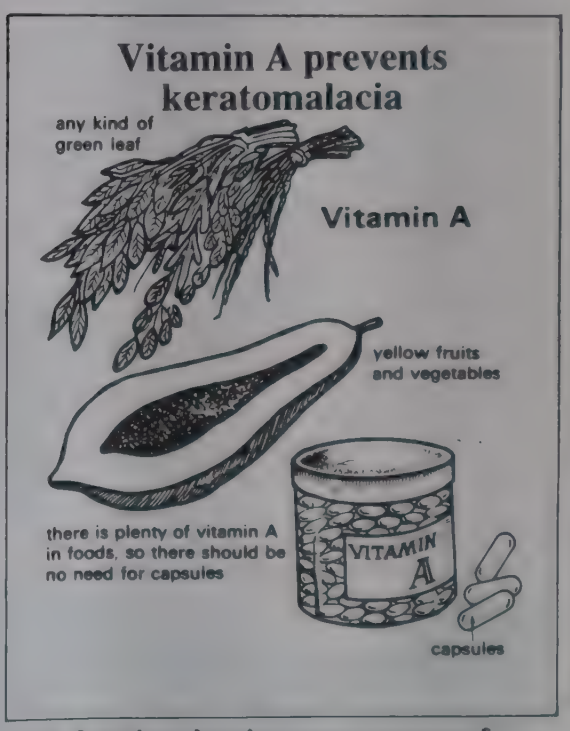
Conserving vegetables (containing vitamin A) out of season

In areas where fruits and vegetables may not be available all year round, sun drying is a useful way of preserving supplies. Perishable fruits are often lost on the way to markets and can be transported more easily in a dried form.

A simple sun dryer like the one shown in the illustration can dry up to 60 kilos of green vegetables a day in a hot, sunny climate. A most important point is that the vegetables must not be exposed to direct sunlight since this destroys a lot of vitamin A. To avoid this, a simple shade of reeds, stretched hessian or cloth can be supported over the drying tray. This does not interfere with the drying process as the drying is accomplished by sun-heated air rather than by direct sunlight(1).
Dried green vegetables and suitable root and fruit crops will provide concentrated amounts of vitamin A.

What is vitamin A?

Vitamin A is a fat-soluble substance, retinol, found in animal foods and dairy products. Carotene, the naturally occurring substance from which vitamin A is made either by humans or animals, is manufactured by plants, particularly those with dark green leaves or with reddish yellow roots or fruits. Dietary fats, pancreatic enzymes and bile salts are all important for the absorption of both vitamin A and carotene, which are transformed by the lining of the intestine into retinol. Most vitamin A is stored in the liver as retinyl palmitate. Free retinol is highly active but toxic and it is therefore transported in the body in combination with a retinol-binding protein. Retinol is essential for the proper functioning of the photoreceptor cells which detect light striking the retina at the back of the eye Hence the night blindness in early vitamin A deficiency. It is also necessary for the production of healthy new cells to cover the eye and line the different body systems like the gut and respiratory tract. Severe deficiency damages the body's defence against infections.



Line drawing showing some sources of vitamin A.

Reproduced fro 'rimary Child Care: Book I' by Maur...e King et al.

Severe xerophthalmia and keratomalacia only occur when liver stores of vitamin A are extremely reduced.

(1) Appropriate technologies for tackling malnourishment. Jim McDowell CONTACT 45, June 1978.

Further reading: *Xerophthalmia Club Bulletin*. Produced by Mrs A Pirie, Nuffield Laboratory or Ophthalmology, Oxford, U.K.

Carrying out a survey on attitudes to diarrhoea

Mothers' attitudes are critical to the success of ORT programmes. A survey to find out their beliefs should, therefore, be an essential step before developing a programme [1 and 2].

We recently received a study from Haiti offering practical suggestions on gathering information before starting a national oral rehydration therapy programme. The study was begun in late 1981. For a year before then, Haiti had been implementing a hospital based ORT programme [3]. Although attempts had been made to teach mothers about the use of oral rehydration solution for several years, community and home-based approaches to oral rehydration therapy were still new ideas.

The Research Section of the Division of Family Hygiene, Department of Public Health and Population discussed the situation with public health workers and drew up a list of simple questions to ask mothers. The questions were designed to give insight into attitudes to diarrhoea in the community and mothers' beliefs about its cause and cure. The questions included:

- How do you know when your child has diarrhoea?
- What causes it? What other names do people use for diarrhoea?
- Is diarrhoea a disease? Can a child die from it?
- Do you know a child who has died from diarrhoea?
- What do you do when your child gets diarrhoea?
- Should liquids and/or food be given when your child has diarrhoea?
- Why or why not?
- What are good foods/liquids for a child who has diarrhoea?
- Should you continue breastfeeding a child who has diarrhoea?
- Who in your community can help you if your child has diarrhoea? (doctor, health worker, traditional birth attendant, leaf doctor, traditional healer, etc.)
- Is there a particular medicine you give your child when he has diarrhoea? Which one?
- Would you like to learn how to treat diarrhoea with a solution of salt and sugar which you can make in your home?

Photograph by Michael McQuestion

Haitian mothers believe in continued breastfeeding when children have diarrhoea.

Survey in urban areas

These questions were translated into Haitian Creole and posed initially to half a dozen mothers living in or near the capital city. These mothers had already heard of ORT, knew about mixing a home-made solution of sugar and salt, believed strongly in continuing breastfeeding, giving liquids (boiled and carefully handled), and spoke of reducing heavy, fat foods but not eliminating food altogether. The families were also aware of the danger of dehydration from diarrhoea and knew they were dealing with a potentially serious health problem. They generally recommended seeing a doctor and knew specific health facilities where they could get help.

While the first interviews also provided ideas on foods and liquids that are traditionally considered good and bad in treating diarrhoea (diarrhoea is considered to be a "hot" illness in Haiti so "cool" foods must be given), the mothers had obviously already had some exposure to modern ideas.

Rural areas

Consequently, the next interviews were with mothers in more isolated rural areas. A total of 16 interviews lasting between 10–30 minutes were taped. Rather than transcribing all the data, the cassettes were replayed several times and notes taken on the most relevant points. The fieldwork in five different rural areas was done by the Haitian Center for Applied Linguistics, which was gathering data for a linguistic atlas of Haiti and offered to cooperate with the Division of Family Hygiene's Research Section.

The age of the respondents varied between 20 and 70 years. All the women interviewed recognized diarrhoea by the presence of liquid stools in great quantity and most saw it as a life-threatening disease. The majority said that food intake should not be stopped during diarrhoea, and generally had reasonable ideas of the type and quantity of food to provide.

The general consensus was that breastfeeding should continue in order to give the child strength and that

liquids (tea, juice, rice water, cow's milk) should continue as well. Half of the respondents had already heard of ORT.

The causes of diarrhoea mentioned included teething and 'spoiled' mother's milk as well as some modern beliefs related to poor hygiene. Treatment of diarrhoea begins at home but many of the mothers mentioned the need to seek medical assistance.

Results

The main results of this small study were confirmed in a larger nutrition survey of almost 900 mothers which included questions about their views on the nature of diarrhoea, and feeding practices to follow when it occurs. This supported a general feeling that mothers in rural Haiti are very favourable to the introduction of an ORT programme. There do not appear to be traditional attitudes and beliefs that are obstacles to a national effort to treat diarrhoea. Mothers seem to be quite ready to take action when diarrhoea strikes and are ready to accept an appropriate technology.

In Haiti a complex magico-religious system underlies views of health and illness and what can be done to resolve problems. While a simple study focusing on practical issues in ORT did not need to analyse this system in detail, a sympathetic awareness of the importance of traditional medicine (often all that people in rural areas have to help them in major crises) is very important. The team who carried out the study described here plan further work on this subject.

Study sent by Dr James Allman, Center for Population and Family Health, Columbia University and Dr Maryse B. Pierre-Louis, Division of Family Hygiene, Department of Public Health and Population, Port-au-Prince, Haiti.

(1) Rohde J E 1980 Attitudes and Beliefs About Diarrhoea: The Mother's Role. Diarrhoea Dialogue 2: 4–5

(2) Lozoff B, Kamath K R and Feldman R A 1975 Infection and Disease in South Indian Families: Beliefs About Childhood Diarrhoea. Human Organization Vol 34, No. 4: 353–358

(3) Pape J 1981 Introduction and Promotion of Oral Rehydration Fluids in Haiti. USAID, Port-au-Prince, Haiti.

General points to remember:

Many people dislike or distrust surveys. This is particularly true in poor communities which are frequently studied but rarely see any results. Proper organization of a survey and a sympathetic approach when carrying it out will make it far more likely that the end results will be acted upon.

- Try to find out what problems people feel are most important and see what ideas **they** have for solving them.
- **Only** ask for the **minimum** amount of information necessary for the survey. Make sure that people understand **why** you are collecting the information.
- Talk to enough people to ensure collection of a cross-section of opinion from within the community. The number of people you can reach will obviously depend on the questioners available. If you are training questioners, it is very important to spend time on this. An unsympathetic, abrupt approach when asking questions can produce forced answers and ruin a survey.
- Try to ask questions in such a way that people can learn something at the same time as they answer. Avoid asking leading questions and if a person does not understand what to reply, offer several different possibilities including an open response like 'none of these answers'.
- If possible, try to avoid using questionnaires when talking to people (small tape recorders were used in the Haiti study).

However, you will need questionnaires/checklists at some stage to set down the information gathered in a logical way. Apart from the questions listed on page six, the following topics could also be included in a diarrhoea survey:

- What household remedies are available for diarrhoea?
- Does each household have a supply of salt and sugar which could be used for making oral rehydration mixture?
- What containers are available for storing water, mixing up a solution and measuring salt, sugar and water?

Your survey could also include the local shops, pharmacies and the nearest dispensaries and health centres. At these places check:

- Which diarrhoea treatments are used.
- How much stock is kept and the turnover.
- Availability of packets of oral rehydration salts (ORS).
- If alternatives are used what do they cost and what is their chemical composition?

It is also important to examine water sources, storage of water and the use and maintenance of sanitation.

Summary of the important steps in a diarrhoea survey:

- Consider the questions that will provide the necessary information to improve the diarrhoea service.
- Set these out in a questionnaire and test them with and on local people.
- Choose and train questioners.
- Survey a representative number of people in the community.
- Summarize the results and apply them to modify and improve the diarrhoea prevention and treatment services.

Useful further reading:

Barker DJT 1976 Practical Epidemiology. Oxford University Press.

Bennett F J 1979 Community Diagnosis and Health Action. The Macmillan Press Ltd.

Cutting W A M et al 1981 A worldwide survey on the treatment of diarrhoeal disease by oral rehydration in 1979. Annals of Tropical Paediatrics 1:4: 199–208.

McCusker J 1978 Epidemiology in Community Health. African Medical and Research Foundation, Nairobi, Kenya.

Werner D, Bower B 1982 Helping Health Workers Learn. The Hesperian Foundation, PO Box 1692, Palo Alto, California, USA.

Getting the message across

A health education programme that is to be effective, whether nationally or locally, must use many ways of getting its message across. Posters, puppets, cartoons, simple leaflets and even magic are just some of the methods that can be used to convey basic health messages. Where oral rehydration is concerned, providing sachets of oral rehydration salts or measuring spoons without appropriate instructions may do more harm than good. This page shows three simple ways of telling people about rehydration.

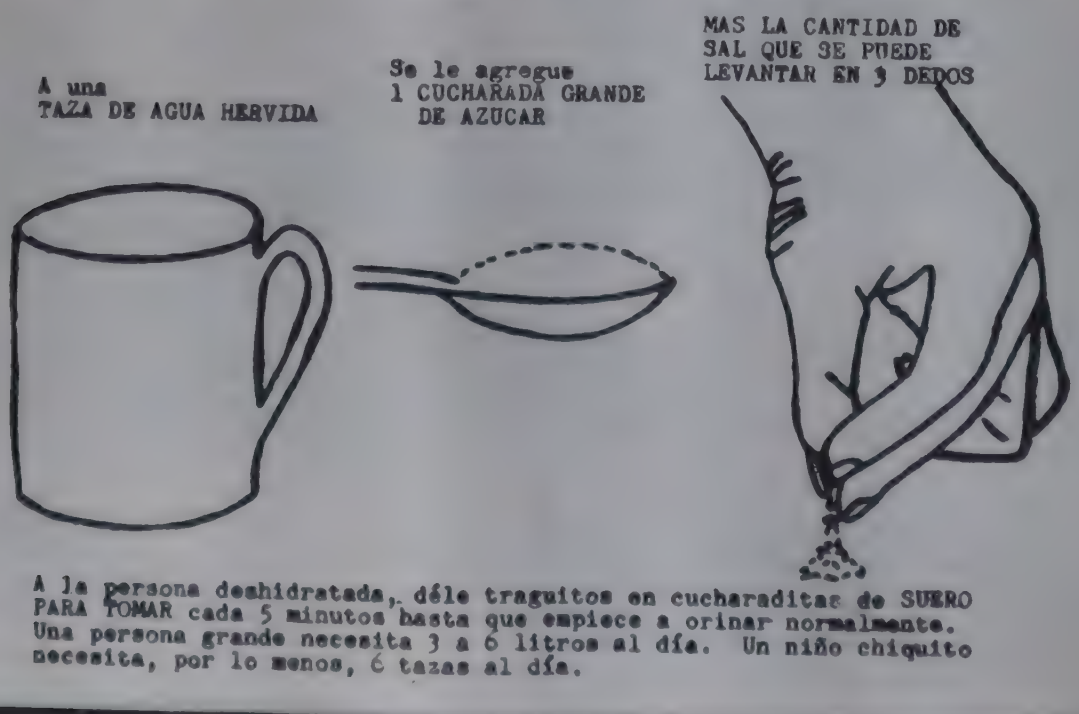
Cartoons

Professor C. Y. Chen of the Faculty of Medicine at the University of Malaya has adapted Jon E. Rohde's story of Abdul and Seri into a local cartoon book. The story shows how older brothers and sisters and grandparents can all help when younger members of the family have to be treated for diarrhoea. The story has also been converted into an audio visual set for use in West Malaysia.

Abdul and Seri.

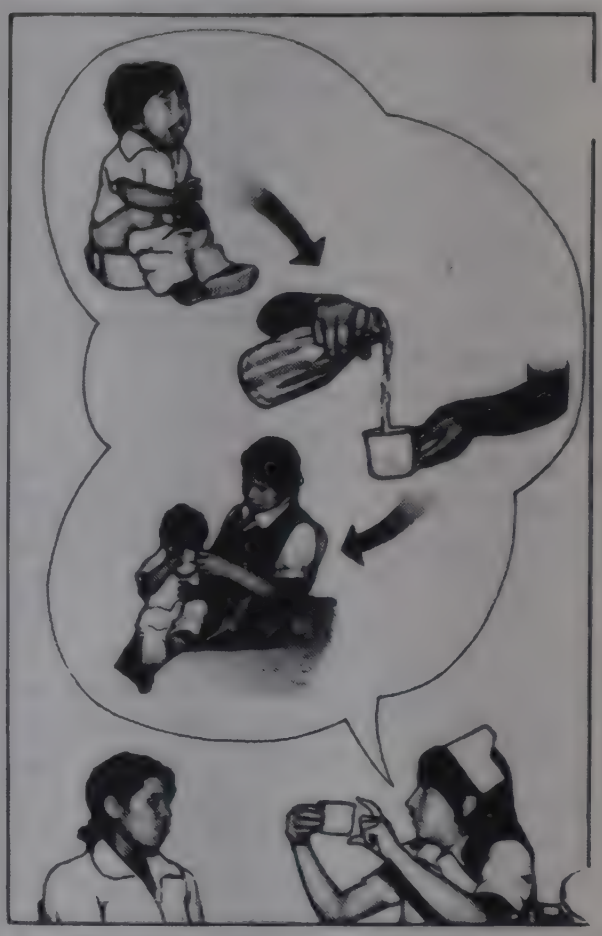
Local leaflets

Our illustration showing how to mix oral rehydration solution is taken from a simple course on common diseases produced by the Programa Promotores de Salud in Huehuetenango, Guatemala. The leaflet also contains basic advice on respiratory and stomach infections and a chart for keeping a record of the patient's health.



PIATA

PIATA-Mexico has developed a leaflet on oral rehydration salts for use in the National Health Programme. The leaflet has been tested in rural areas, especially among illiterate women. It is used by auxiliary health personnel to explain to mothers how to prepare the solution, when to give it and how often to give it. The importance of continuing to breastfeed the child during the treatment is also stressed.



An illustration from the PIATA leaflet which conveys the message about oral rehydration in a simple way.

A copy of the pamphlet is given to the mother with a packet of oral rehydration salts and serves as a reminder of the verbal instructions given by the health worker. The pamphlet does not contain words. A small version of the leaflet is now available, the same size as the packet of oral rehydration salts. If you would like further information on the design, testing or adaptation of these materials, please contact PIATA (Programa para la introducción y adaptación de tecnología anticonceptiva) Shakespeare 27, Mexico 5, D.F., Mexico.

Simple but not easy

Health education materials using only pictures are needed in many countries. The end result may look simple but the development and production process is complex. Margot Zimmerman and Joan Haffey describe PATH's* work in this field.

PATH has been preparing illustrated materials for non-literate audiences for several years. Their first health-related pamphlet, on how to mix and give oral rehydration salts (ORS) solution to a child with diarrhoea, was designed in Mexico.

Other PATH* projects to develop instructional materials and packaging to improve the understanding and acceptability of ORS have been carried out in Bangladesh, Indonesia, the Philippines, and Thailand [1]. A new project was recently begun in Sri Lanka.

Broader lessons

Besides the detailed guidelines above, PATH has also learned some broader lessons. These apply to any efforts to communicate information about health or development.

Continuous field-testing and revision As materials are prepared, continuous field testing and revision with the intended audience are essential to ensure that the materials are understood and serving their purpose.

Multi-level approach When introducing a new product or method, a broad approach to providing information to all those who will come in contact with it is best. Doctors, nurses, fieldworkers etc. all have different information needs, and materials should be appropriate to the services they perform and what they need to do their work more effectively.

Involving the national programme early A pilot project that is developing materials intended for use on a wider scale must involve the final distributor of the materials at a very early stage. PATH has seen from its own experience that failure to do this can prevent even successful materials from ever being used throughout a country. Government staff must feel a part of the project. This also helps to ensure that elements of the message or materials design will be appropriate to *mass* distribution.

Unexpected findings Project staff should realize that this work can lead to unexpected findings. While evaluating the Mexican ORS pamphlet, it was found that, despite the scepticism of both US and Mexican staff conducting the research, both men and women preferred a version of the pamphlet showing active involvement of the father in the care of the sick child to one with only the mother. New projects will teach new lessons to target audiences and staff alike.

National self-sufficiency Pilot projects that develop information materials by using the methodology described here also serve a broader purpose: project staff will be learning skills that build a national expertise in producing other information materials. This can lead to national self-sufficiency in this type of education and communication.

Guidelines for production

From its work in this field PATH has developed guidelines for the production of instructional material for non-literate communities:

- Keep pictures as simple as possible. A crowded scene will divert attention from the message being conveyed.
- Though excessive detail interferes with understanding of the message, comprehension may also be reduced by over-simplication.
- Content must be limited to the most important messages. Only 8-12 major points can be effectively covered in a single pamphlet.
- Each picture and each page should have a single, sharp meaning.
- Visual symbols should be as realistic as possible.
- Pictures are more likely to be successful if faces, clothing and buildings are based on what is familiar locally.
- Use only familiar objects and symbols to portray a message. For example, many different kinds of light sources could be used to signify night (a light bulb, a kerosene lamp, a candle, a metal lamp). The symbol chosen must be tested with people from the intended audience to ensure it is appropriate.
- Material produced for national distribution may not be equally appropriate for all regions of the country.
- The ideal length for a pamphlet is usually 16 pages. This often corresponds both to the space necessary to depict 8-12 major messages and to the attention range of most readers. It is also usually the most economical format for high-speed printing presses.
- Initial print runs should be small, even if the cost per copy is higher, so that changes can be made following further evaluation and before mass distribution.
- Understanding of the picture is greater when a person's whole body, rather than just part of it, is illustrated.
- If the material will be printed in more than one colour or will include simple words, these choices should be pretested in the same way the illustrations are tested. Remember that certain colours have different meanings in different societies.
- Using colour at all also adds to the production cost, an important point to remember.
- Non-literate people do not necessarily look at pictures in the order intended. As messages are being tested, it is useful to ask several groups of people to arrange them into the sequence that seems most logical to them.
- The design and testing of simple materials are more complicated and require much more time than the development of written materials. **Simple does not mean easy.**
- The intended audiences should always have the final say about the content, illustrations, and sequences used.
- Not all kinds of technical information can be transferred through illustrations. Pictures can probably be used to teach someone how to change a motorcycle tyre, but it is doubtful they can be used to teach a person to drive that motorcycle.

Margot Zimmerman and Joan Haffey, PATH, Canal Place, 130 Nickerson Street, Seattle, Washington 98109, USA.

**PATH — the Program for Appropriate Technology in Health.*

[1] Reprints of a paper describing these projects, "ORS: Promotion of Acceptability and of Safe and Effective Use," are available from PATH.

Evaluation of training

Birger Forsberg describes several methods for evaluating the impact of training on the practices of health workers.

Training in programmes for the control of diarrhoeal diseases (CDD) is very much oriented towards changing health workers' performance in supervisory activities and their behaviour in the treatment of diarrhoea. It is becoming increasingly important to evaluate this aspect as countries accelerate their programme activities. Some countries have started to develop methods for evaluating the impact of training on the practices of health workers.

Follow-up

In the United Republic of Tanzania, for example, a series of clinical management workshops was held in 1986. Supervisory visits are now being made to participants, six to 12 months after the training, to assess how they are applying the skills taught at the workshops. As one of the objectives of the training was to teach participants how to organise diarrhoea training sessions, this area is given special attention during the follow-up visits. The trainees are given the opportunity to explain their problems and the assistance they need to successfully promote proper diarrhoea management in their hospitals. This type of follow-up is appropriate when a training programme is focused on a small group of persons who have a major responsibility in the CDD programme. It is not feasible for the evaluation of large-scale training activities.

Nepal provides an example of how extensive programmes can be evaluated. The country is training health workers in a new regionally phased programme. During a CDD programme review in 1986, the practices and skills in the treatment of diarrhoea of a random selection of health workers were assessed (Table 1). Records showed that children treated at health posts in districts where the staff had been trained were significantly more likely to receive ORS than those in 'untrained' districts. There was little difference in the use of antibiotics between the two groups. Written guidelines for diarrhoea treatment were available more than twice as often in facilities with trained personnel.

Table 1. Availability of written guidelines and frequency of treatment of diarrhoea with ORS and antibiotics at health posts, Nepal

	With trained staff		With untrained staff	
	No.	Per cent	No.	Per cent
Health posts surveyed	13	—	13	—
Posts with treatment guidelines	7	54	3	23
Diarrhoea cases in under-fives	219	—	103	—
Cases treated with ORS	156	71	48	47
Cases treated with antibiotics	178	81	96	93

Comparing trained and untrained health workers

Interestingly, interviews with health workers did not reveal any differences between trained and untrained health post workers in knowledge of how to assess and treat diarrhoea, primarily because the untrained health workers were fairly familiar with these skills already. This suggests that the training has been partially successful in changing the practices of the health workers with regard to the use of ORS. Further efforts must now be made during training to discourage the use of antibiotics.

Checking records

Another example can be taken from Sudan. A rural health training programme was evaluated by a review of daily attendance records at different health stations. This involved counting total numbers of visits, diarrhoea and dysentery cases, and cases given antibiotics, ORS, or both. Records were checked before training in ORT, and at intervals of one, six and 18 months after training. The results are shown in Table 2.

The training appears to have had a definite impact on the behaviour of the health workers; ORS was prescribed much more often and antibiotics less often than before the workshops.

Evaluation is an important part of training programmes. These examples illustrate some ways of evaluating the impact of training on the actual performance of health personnel:

- follow-up visits including discussions with trainees;
- interviews, observation and comparison of trained and untrained health workers; and
- checking and comparison of hospital records before and after training.

Health staff in charge of CDD programmes and Diarrhoea Treatment Units (DTUs) could consider including such methods in their training programmes.

Birger Forsberg, MD, Evaluation Officer, CDD Programme, WHO, 1211 Geneva 27, Switzerland.

DD would like to hear from readers about their own experiences with evaluation of training.

Table 2. Diarrhoea and treatment with ORS and sulphonamides, Sudan

	No. of cases	ORS	Sulphonamides
		%	%
Before introduction of ORT	1140	8	76
1 month after training workshops	698	64	45
6 months after training workshops	1981	59	38
18 months after training workshops	4060	72	22